DC:

Introduction To Electricity

UNCLASSIFIED;

2 Hour, Conference.

Safety & Environmental impact is LOW.

DC: INTRODUCTION TO ELECTRICITY

TERMINAL LEARNING OBJECTIVE: {TLO}

ACTION:
Identify electrical and electronic terms, units, symbols, and circuit concepts.

CONDITIONS:
Given a classroom environment and official OMEMS reference materials.

STANDARD:
Be able to define and understand the correct terms, units, symbols, and concepts associated with voltage, current, and resistance. Correctly answer questions concerning Introduction to Electricity to the established standard of 7 correct answers out of 10 & 8 out of 10 for EOD.

Introduction

All professional disciplines have terms, units of measure & laws that are a common form of communication among professionals.

Electronics is an Applied Physics, the study of the electron and its behavior in a circuit.

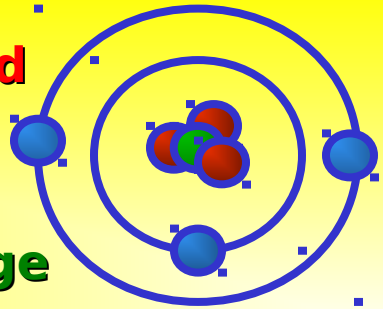
Atom

DC: INTRO TO ELEC; VOLTAGE

PROTONS **+** **charged**

ELECTRONS **–** **charged**

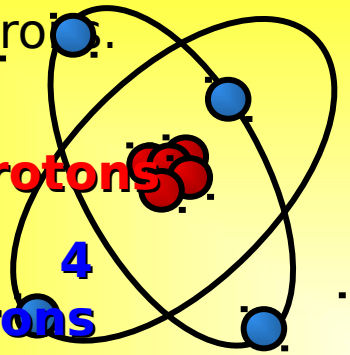
NEUTRONS **No charge**



+ ION Atom has More **PROTONS** than electrons.

+5 Protons

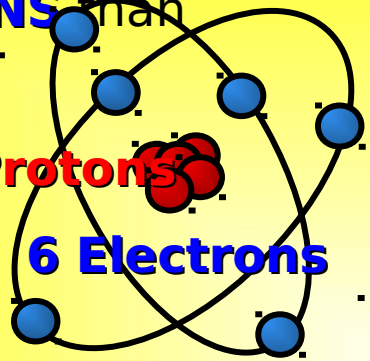
– 4 Electrons



– ION Atom has More **ELECTRONS** than Protons.

+5 Protons

– 6 Electrons



A **Difference of Potential** exists when atoms become **+** or **-** **Ions**

DC: INTRO TO ELEC; VOLTAGE

Voltage: Electromotive Force, EMF,

Is a Difference in Potential

{ or force }

between two points + & -

That causes electrons to move

or flow in a conductor

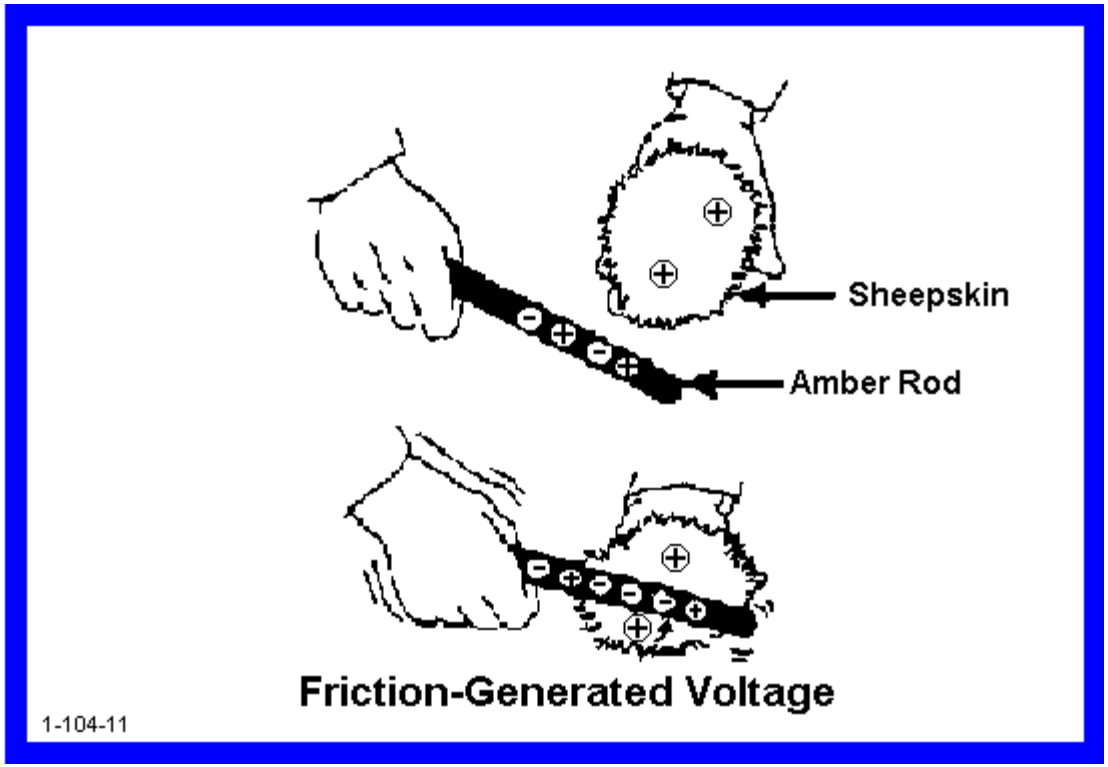
Symbol: E

Unit of measure: Volts or V

Types

DC: INTRO TO ELEC; VOLTAGE

Electrostatic



Thermo Elec.

DC: INTRO TO ELEC; VOLTAGE

Thermoelectric

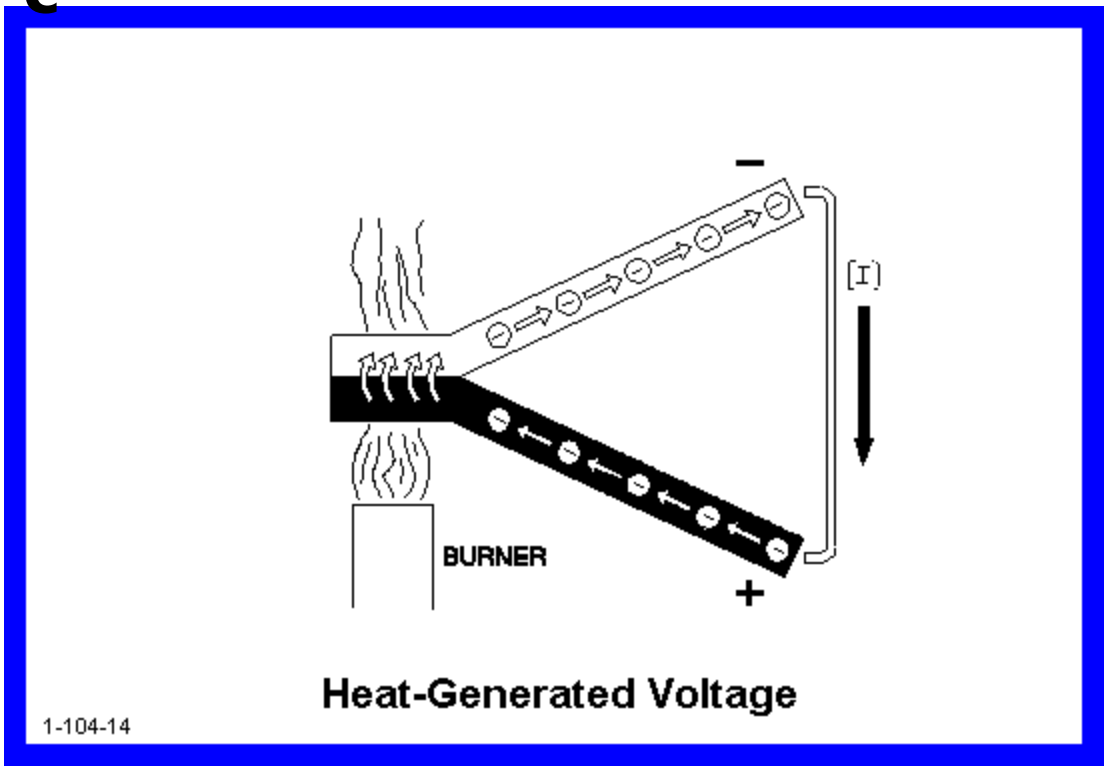
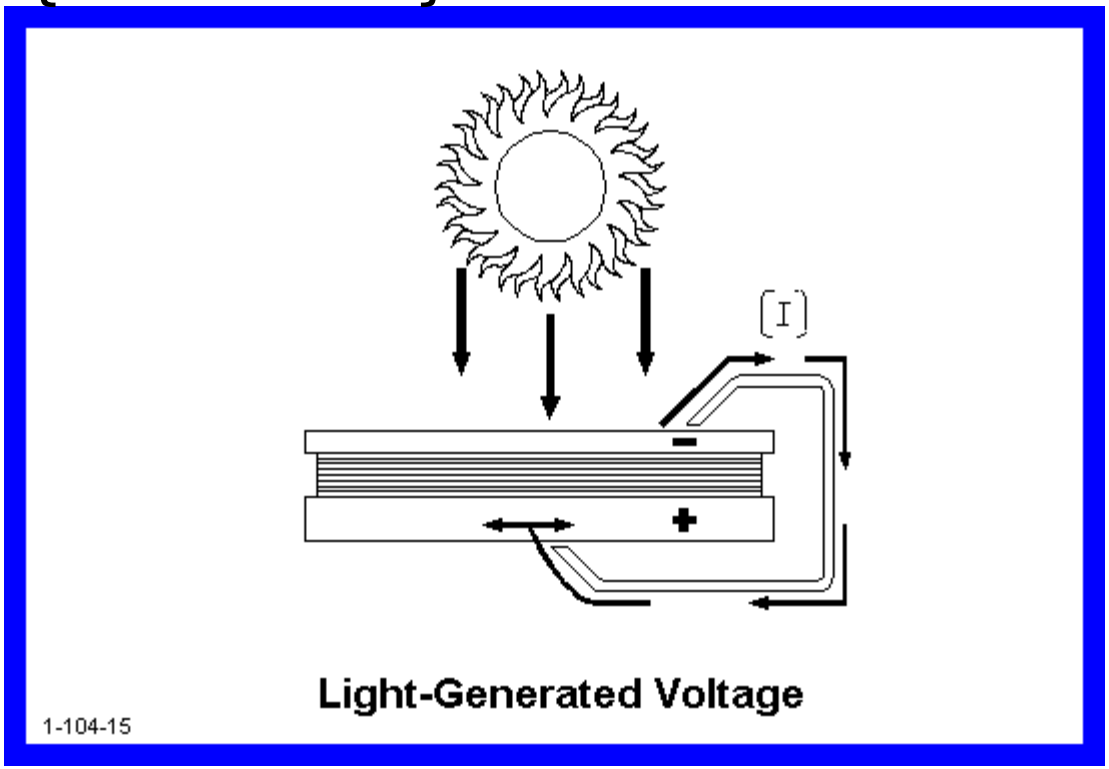


Photo Elec.

DC: INTRO TO ELEC; VOLTAGE

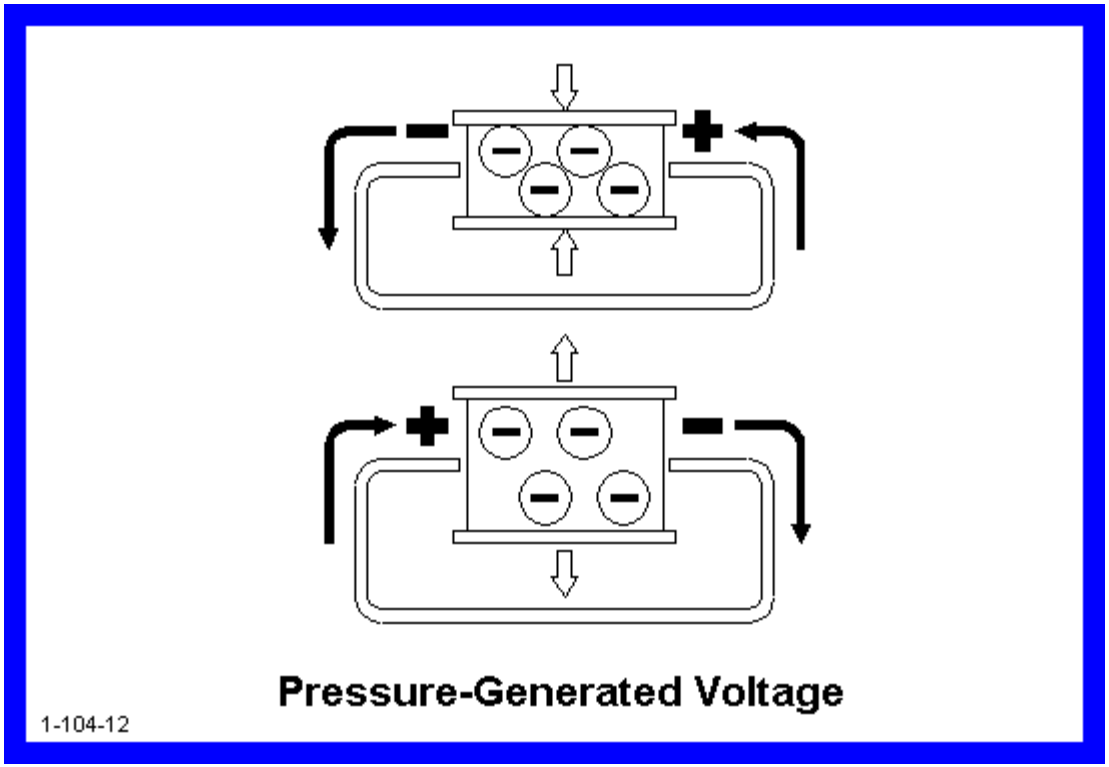
Photovoltaic

{Photoelectric}



Piezo

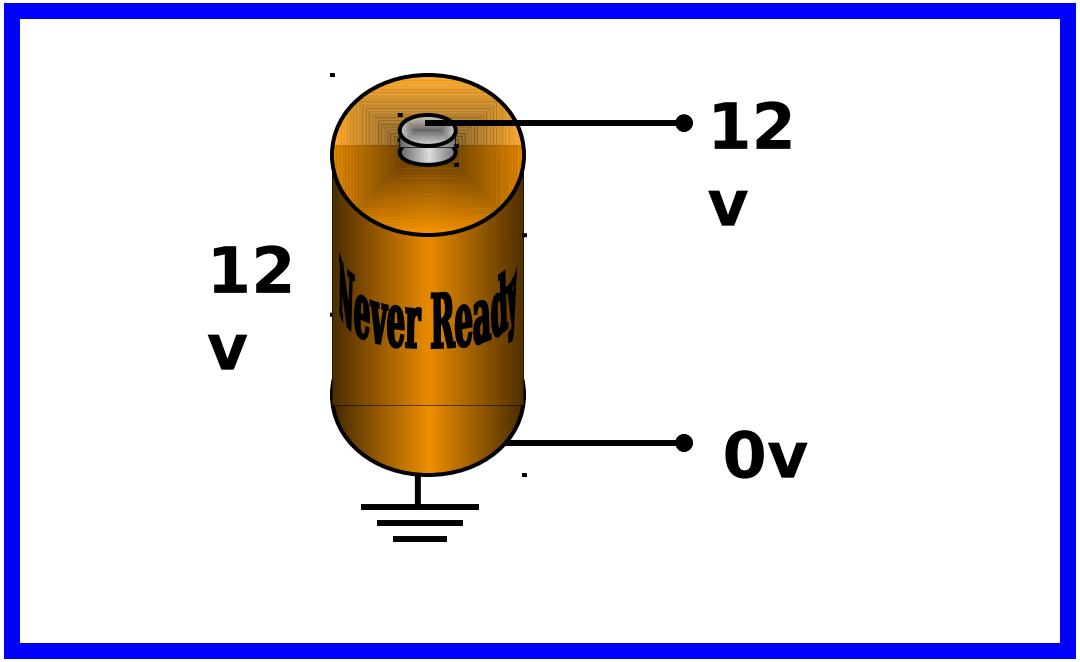
Piezoelectric



Electro Chemical

DC: INTRO TO ELEC; VOLTAGE

Electrochemical



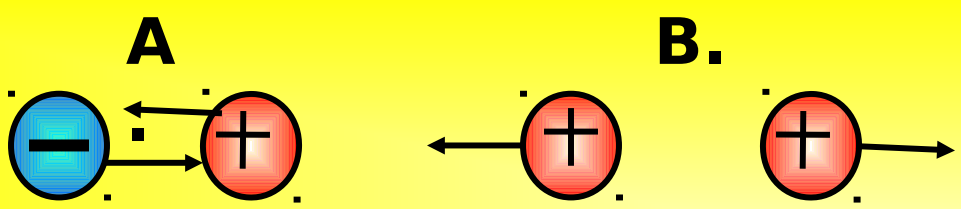
Law of Force

DC: INTRO TO ELEC; CURRENT

LAW of Electrostatic Force:

A. Opposite Charges Attract.

B. Like Charges Repel.

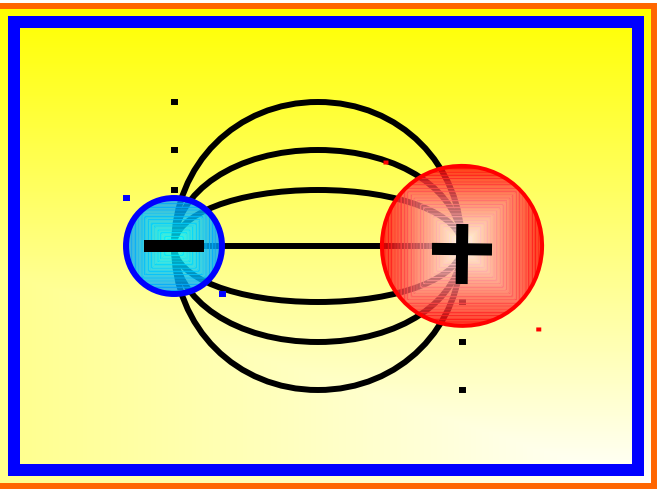


Lines of Force

DC: INTRO TO ELEC; CURRENT

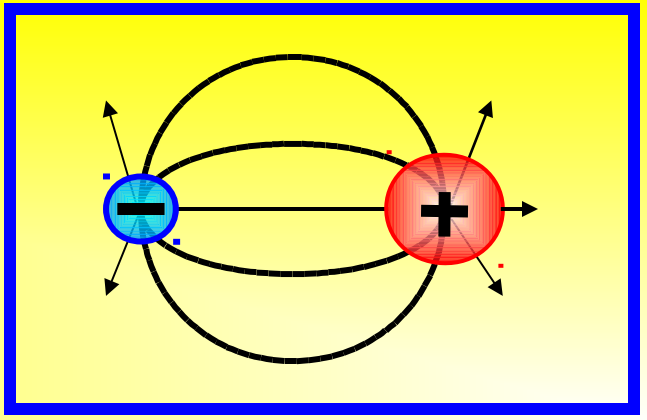
The closer together, the stronger the lines of force.

The electron is not easily displaced or moved.



The further apart, the weaker the lines of force or attraction.

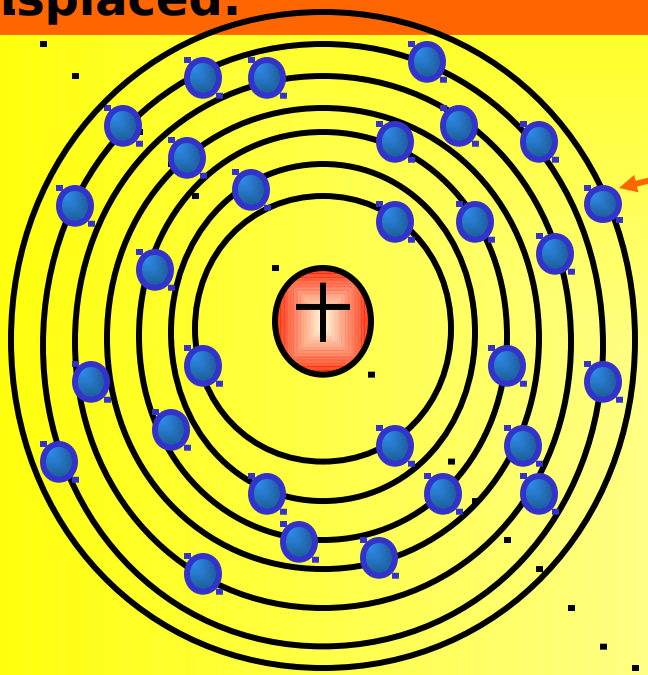
The electron is easily displaced or moved.



Copper Atom

DC: INTRO TO ELEC; CURRENT

The electron in the outer orbit is easily displaced.



1 ELECTRON
Valence Ring

CU Copper Atom

- 29 Electrons

+ 29 Protons

= a Balanced Atom

Conduct or

DC: INTRO TO ELEC; CURRENT

Conductor: A material with loosely bound electrons that are easily displaced from their orbits when a difference in potential is applied, thus providing a path, or conduit for current flow.

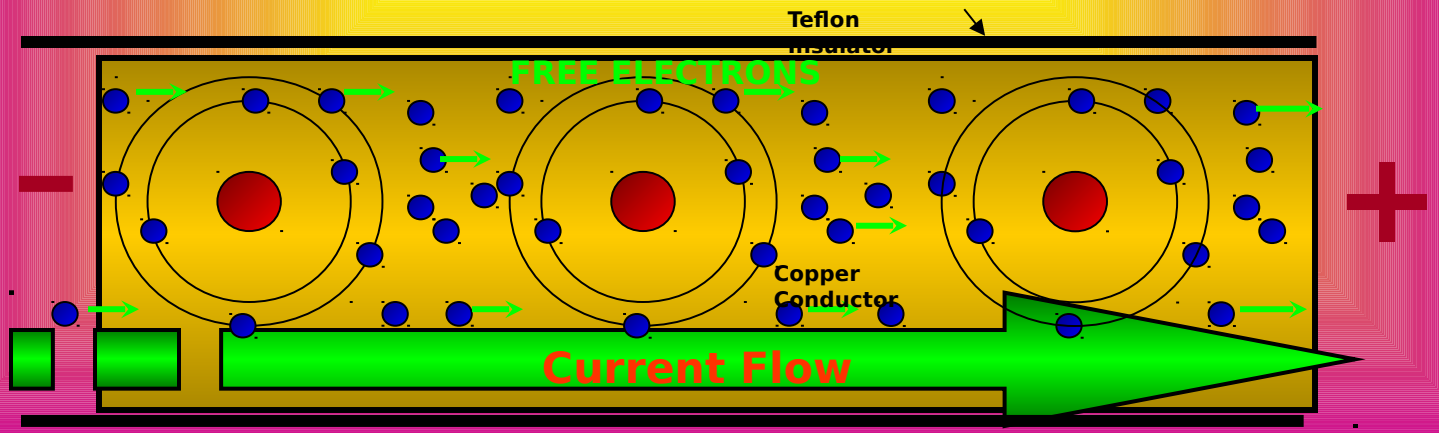
Insulator: A material with tightly bound electrons in their respective orbits; thus an insulator does not provide a ready path for current to flow.

DC: INTRO TO ELEC; CURRENT

CURRENT: The **MOVEMENT OF ELECTRONS** From the most **Negative** to the most **Positive** point in the circuit. Symbol: **I**

DIRECT CURRENT: Is the same in Magnitude & Direction

Measured in units of:Amperes, {Amps} A

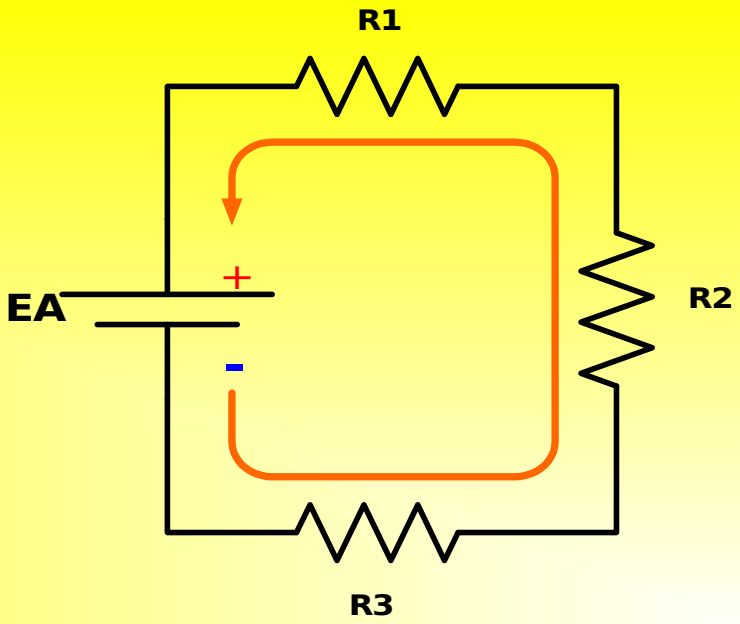


Current concept

DC: INTRO TO ELEC; CURRENT

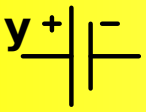
Current will flow **from** the most **Negative** point of the circuit {CKT}, **to** the most **Positive** point in the CKT.

The CKT is said to have continuity or is complete, thus enabling current to have a path to follow.



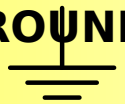
Schematic Symbols

Battery



Resistor

CKT. GROUND



Earth or Chassis GROUND

Resistance

DC: INTRO TO ELEC; RESISTANCE

Resistance, is the opposition to the flow of current.

Resistance controls the flow of current.

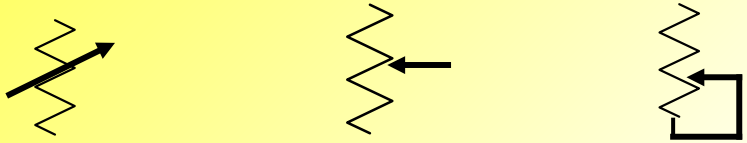
Symbol: R

Unit of Measure: Ohms, Ω

2 Major Types of Resistors:

1. Fixed Value:

2. Variable:



Common symbol Potentiometer Rheostat

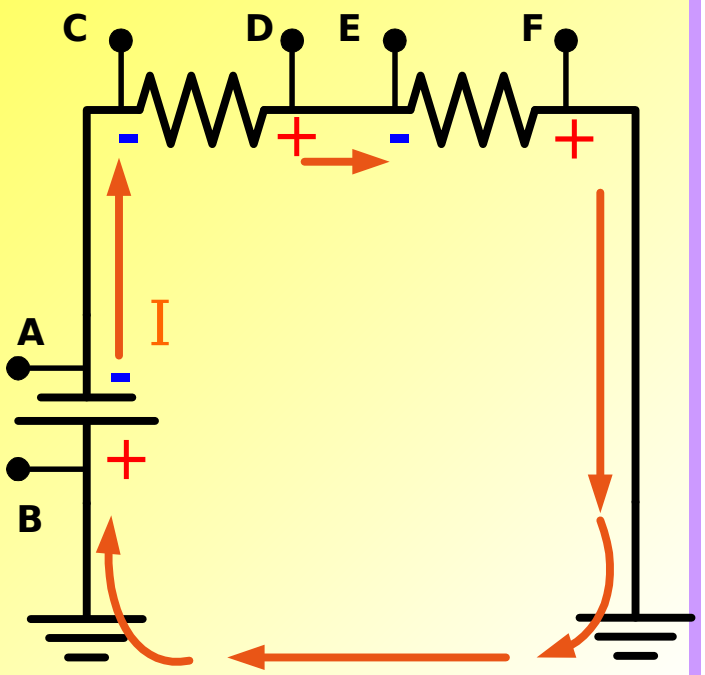
Voltage Drop

DC: INTRO TO ELEC; Circuit Concepts

As current flows, it **enters** a resistor **Negative** – ,

& **leaves** that same resistor **Positive** +

in respect to the point of entry.



The difference in potential felt across the resistor is called the **VOLTAGE DROP**. Or as current flows, the resistor develops a VOLTAGE DROP

Point D is + in respect to C. Point F is + in respect to E.

Point F is + in respect to C. Point C is – in respect to F

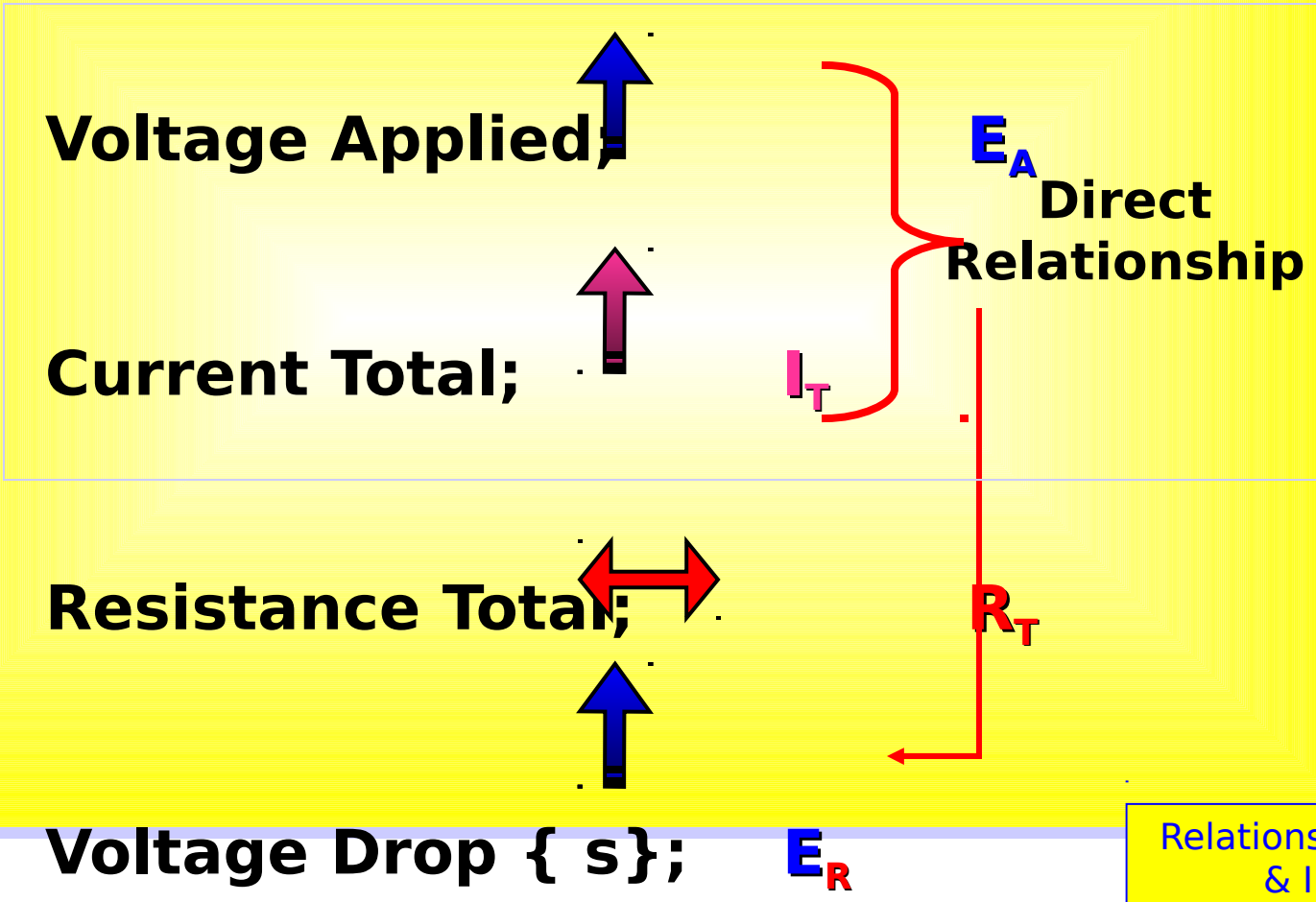
Point A & C are electrically the same.

Point B & F are electrically the same.

Relationship E & I

DC: INTRO TO ELEC; Circuit Concepts

RELATIONSHIP:



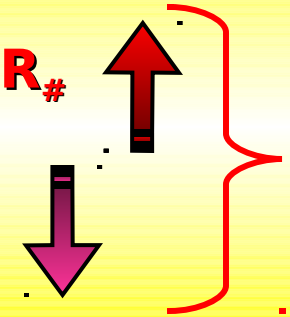
Relationship R & I

DC: INTRO TO ELEC; Circuit Concepts

RELATIONSHIP:

Resistance; R_T or $R_{\#}$

Current; I_T



Inverse or opposite Relation

SWITCHES:

Open; Ckt is open, no current flows.

Closed; Ckt is complete, Current flows, or Continuity is established.

Review Concepts

DC: INTRO TO ELEC; Circuit Concepts

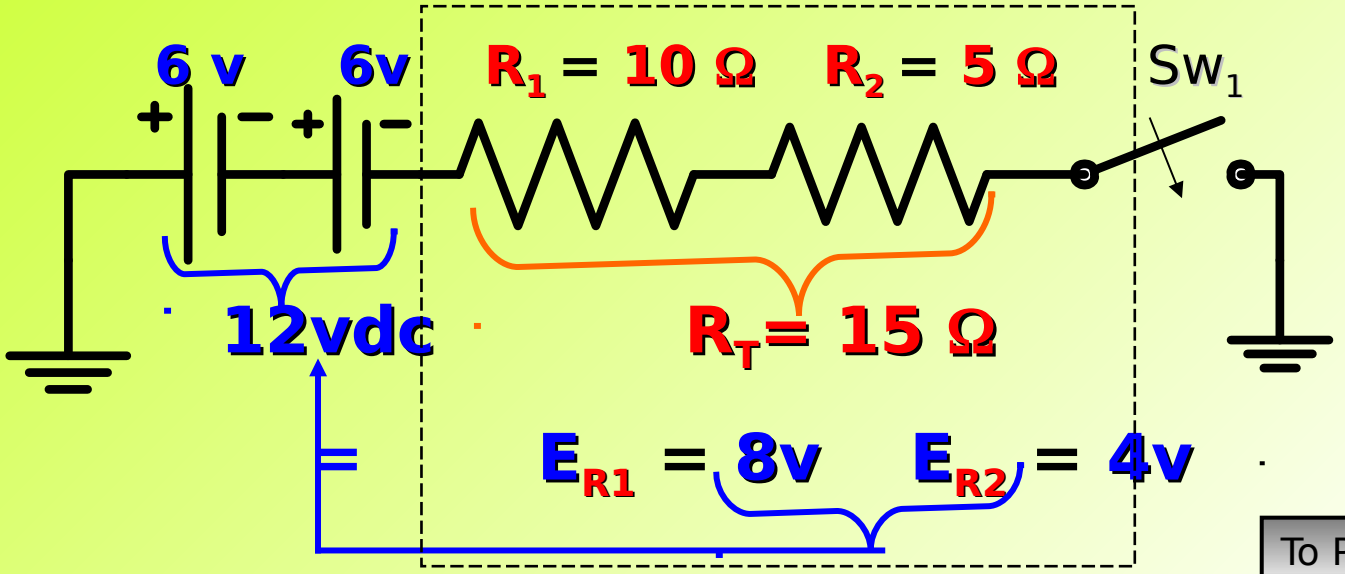
BATTERIES: in series, the Voltages are Additive to = E_A.

RESISTORS: in series, are Additive to = R_T.

VOLTAGE Drops: in series, $E_{R\#}$, are Additive to = E_A.

GROUND [Gnd.]: is a common point of reference,

Electrically the same point.



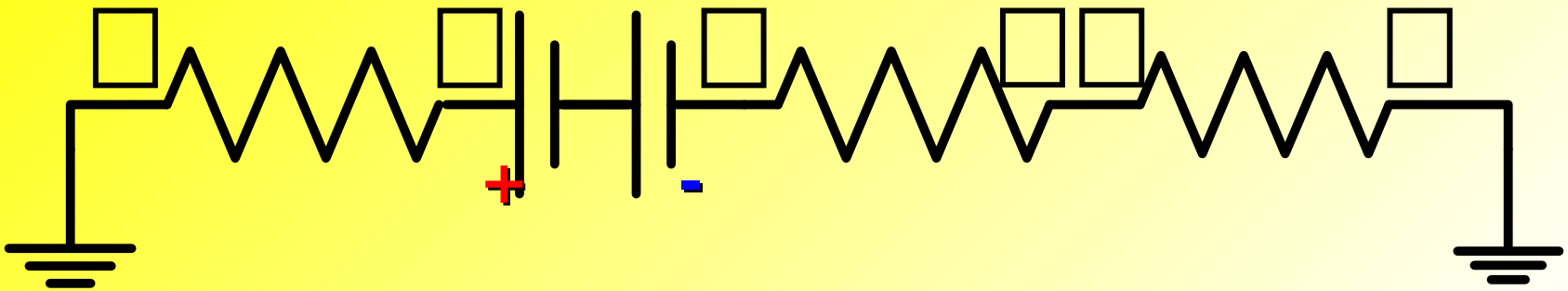
To Problem Sheets

DC: INTRO TO ELEC; Problem Sheets

Fill in The Blanks!

1. Atoms consist of charged particles called _____ and _____.
2. Like charges _____ each other; unlike charges _____ each other.
3. Which charged partials are capable of moving from atom to atom? _____. Are these Partials + or - ? ____ ?

4. Draw an arrow, to show the direction of current flow. Also indicate the polarities, for each resistor [in the boxes] as current enters & leaves each resistor.



Answers 1-4

DC: INTRO TO ELEC; Problem Sheets

5. Current flows because of a force or difference of potential supplied by the battery. This force is called _____ and is measured in units of, _____ .

6. Current is measured in units of _____ .

7. The opposition to current flow is called _____ and is measured in units of _____ .

8. E Stands for _____ , R stands for _____, and I stands for _____.

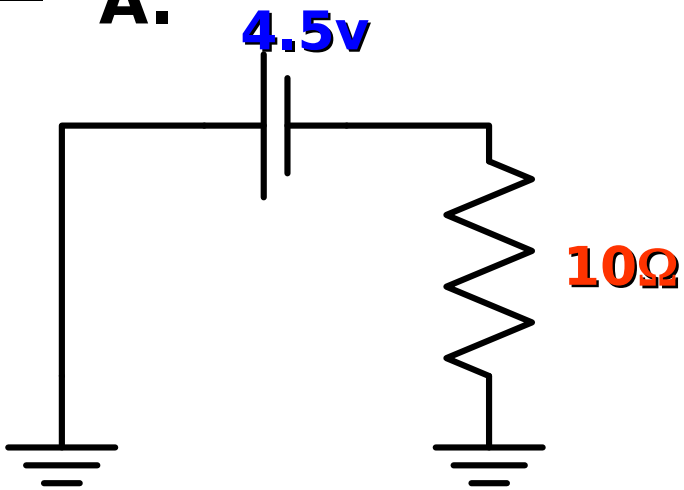
9. As Current flows through a Resistor it develops a _____ _____ across the resistor.

Answers 5-9

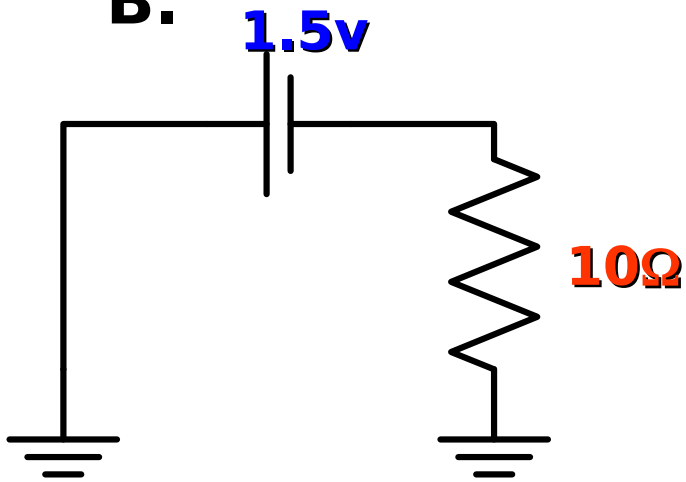
DC: INTRO TO ELEC; Problem Sheets

10. Which Ckt below has more Current flow?

A.



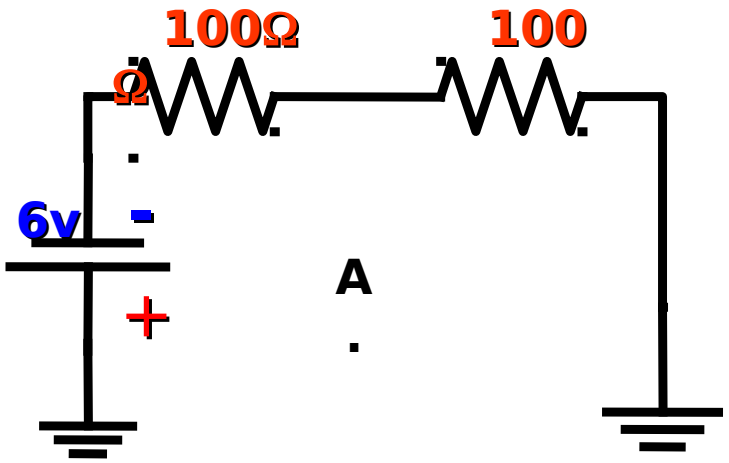
B.

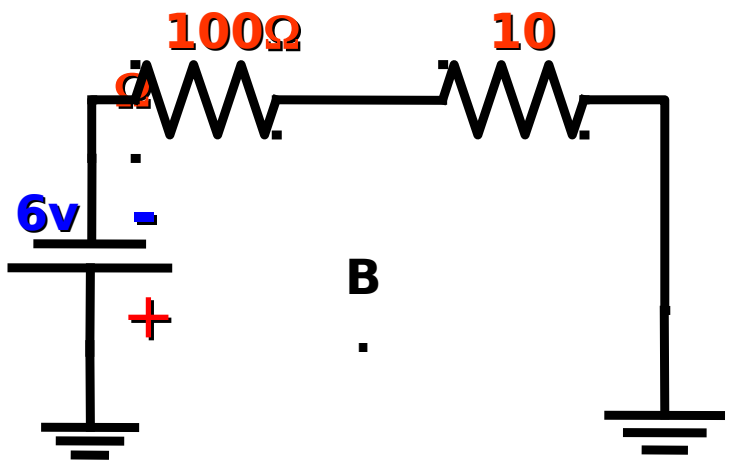


Answer 10

DC: INTRO TO ELEC; Problem Sheets

10 b. Which Ckt below has more Current ? ___. Which Ckt has more Resistance ? ___.





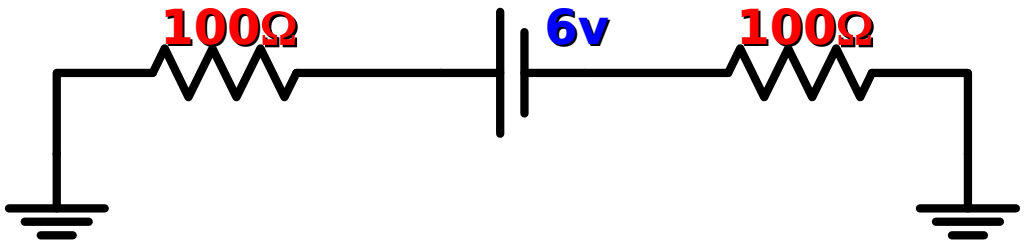
Answer 11

DC: INTRO TO ELEC; Problem Sheets

11. A common reference point in a Ckt is called _____.

12. Look at the Ckt below, if you increase the Voltage, Current will _____, provided the _____ does not change.

But if Resistance is <u>added</u>, Current will _____, provided the _____ does not change or is held constant.



Answer 11, 12

DC: INTRO TO ELEC; Problem Sheets

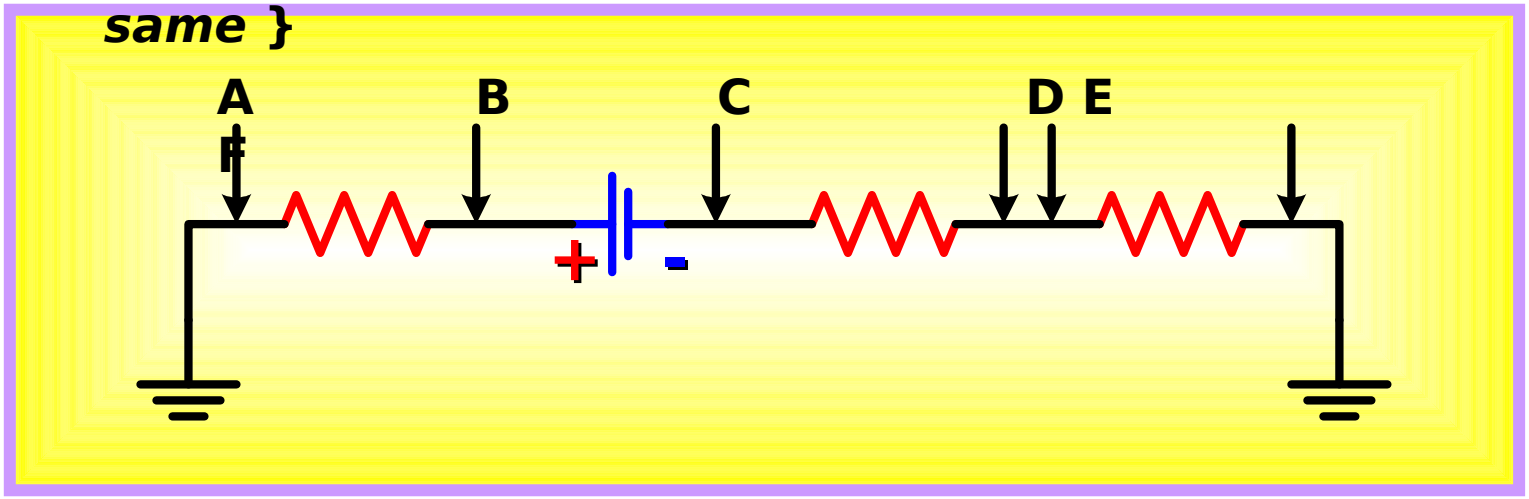
13. Look at the Ckt below and fill in the blanks. All answers should be either + or - .

a. Point D is ___ in respect to point C.

b. Point C is ___ in respect to Ground. { *F & Gnd same* }

c. Point F is ___ in respect to point C.

d. Point B is ___ in respect to Ground. { *A & Gnd same* }



Answer 13

DC: INTRO TO ELECTRICTY

SUMMARY & QUESTIONS:

LESSON TEST:

Time; 20 Minutes.

References; Yellow & Salmon Training Aids.

Standard; 70% minimum. 80% for EOD